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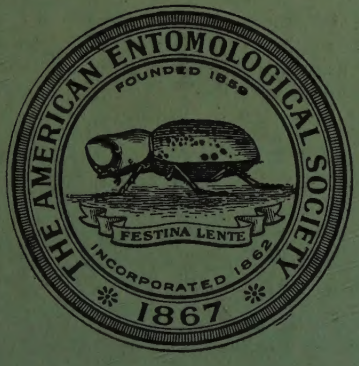

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TRANSACTIONS

OF THE

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VOLUME LXXXI

LARVAE AND PUPAE OF THE GENERA MICRODON AND MIXOGASTER

(DIPTERA, SYRPHIDAE)

BY CHARLES T. GREENE

College Park, Maryland

INTRODUCTION

The genus *Microdon* is one of the most peculiar genera in the family Syrphidae, in fact in all the Diptera, both in its adult and larval forms. The larvae are so unusual that in three instances *Microdon* larvae have been described as mollusks, first by von Hayden (1823), by von Spix (1824), and again von Hayden (1825) published his second paper on *Microdon,* still thinking it a mollusk. To add to the confusion, Conrad (1842) described a genus of Silurian bivalves under the name *Microdon.* In 1839 Schlotthauber presented before German naturalists assembled at Pyrmont a carefully written paper, with illustrations, to prove that the organisms described by von Hayden and von Spix, as mollusks, were really the larvae of *Microdon mutabilis* (L.). This paper was not published but was mentioned in a brief reference in Iris von Oken, 1840, pp. 922-23.

Wheeler (1908) gives an interesting historical outline of these larvae, including a fine bibliography.

The three genera *Microdon, Mixogaster* and *Rhopalosyrphus* are closely related in the adult forms but the two latter genera with their petiolate abdomen, slender legs and wasp-like appearances, show a greater relationship to each other than to *Microdon*. In *Microdon* the abdomen is usually very broad and robust on the basal half and the legs are incrassated. The exceptions show the base of the abdomen at least as broad as the apical portion.

Larvae of *Microdon* and *Mixogaster* show a resemblance. In *Microdon* the larva is usually only a little longer than its width, flat ventrally and usually has a marginal band with fringe. The only exception is in *M. wheeleri* Mann where the larva is cylindrical, much longer than its diameter and both marginal band and fringe are absent. In *Mixogaster* the larva is shaped like that of *Microdon* with the marginal band but without the fringe. The larva is much longer than wide and in general the shape corresponds to the slenderness of the adult fly. The dorsal reticulation is typical of the two genera mentioned above but there are a few species without it. Its presence or absence is of specific value only.

The immature stages of the genus *Rhopalosyrphus* are unknown.

The larvae of *Microdon* are of the metapneustic type and are usually but slightly longer than wide. In shape they are similar to a box tortoise, broad, highly convex above and flattened below. They are extremely slow in their movements and so far as known all live as commensals in the nests of ants. The larval habits of *Mixogaster* are identical with those of *Microdon*.

The anterior spiracle shown in the drawings is absent in the larval stage. It develops in the pupal stage only.

The marginal band is interrupted in a V-shaped fashion in the middle of the anterior end of the larva. Ordinarily the band seems to be continuous, but when the head is protruded the V interruption disappears.

Species 1 to 4 have not been reared successfully to adults. The drawings are included with the hope that some interested person may collect them again and rear them to the adult stage.

The material used in this study is in the collection of the U. S. National Museum.

Key to Genera

Larvae and pupae usually with a marginal band and one or two rows of long marginal fringe ..... *Microdon*

Larvae and pupae with a marginal band and a ventral row of microscopic fringe ..... *Mixogaster*

Key to Larvae and Pupae of *Microdon*

1. Larvae and pupae with a dorsal reticulation 9
   Larvae and pupae without dorsal reticulation 2
2. Without marginal band or fringe ..... *wheeleri*
   With marginal band and bristles 3
3. With small dorsal tubercles 4
   Without small tubercles 6
4. With a marginal row and numerous dorsal, smooth, shining, conical tubercles (Larva white, 5 mm. long) ..... *coarctatus*
   With small, rounded tubercles 5
5. With numerous, small, rounded, granulose tubercles (Larva luteous 7 mm. long) ..... *pictipennis*
   With rounded, bristly tubercles, arranged in two longitudinal rows on each side (Larvae deep reddish yellow 6 to 8 mm. long) *Species No. 4*
6. Posterior spiracular tubercle tapering slightly towards the tip and spinose *lanceolatus*
   Posterior spiracular tubercle not as above 7
7. Posterior spiracular tubercle dull on the sides, much broader towards the tip, outer end pointing obliquely downward ..... *manitobensis*
   Posterior spiracular tubercle shining on its sides 8
8. Marginal band narrow; posterior spiracular tubercle about as broad as long, constricted in the middle (sides shining) mid-dorsal area dull, much broader towards outer end ..... *marmoratus*
   Marginal band broad; posterior spiracular tubercle much longer than broad; constricted in the middle (with the sides shining) mid-dorsal area dull, elongate and slightly concave in the middle ..... *globosus*
9. Marginal band penicillate ..... *ruficrus*
   Not as above 10
10. With a longitudinal mid-dorsal and a lateral ridge 11
    Without these ridges 12
11. Reticulated lines made up of small sclerites; each plate with a thick spine in the center; two large spinose tubercles between the posterior spiracular plates ..... *robusta*
    Reticulated lines made up of small tubercles; a short, thick spine between the posterior spiracular plates ..... *Species No. 1*
12. Reticulated lines made up of sclerites; each plate with a thick, curved, spine in the center ..... *Species No. 2*
    Reticulated lines granulose 13

13. With two rows of marginal fringe; posterior tubercle like an inverted Y *megalogaster*

    With only one row of marginal fringe 14
14. Basal portion of spiracular tubercle globular and bristly ..... *piperi*

    Basal portion of spiracular tubercle not bristly 15
15. Basal portion of posterior spiracular tubercle with a mid-dorsal ridge, as viewed from behind ..... *cothurnatus*

    Basal portion without a ridge 16
16. Posterior spiracular tubercle viewed from behind, quadrate; spiracles arranged like four stars ..... *champlaini*

    Posterior spiracular tubercle not as above 17
17. Spiracles sinuous, with finger-like branches; no bristles present *Species No. 3*

    Spiracles not sinuous, arranged in rows radiating outward from the middle; each spiracle with one bristle above and two bristles below *tristis*

Microdon lanceolatum Adams

Kans. Univ. Sci. Bull. 1903, II: 222.

Larva (Fig. 1).—Length 12 mm.; width 7 mm.; height 5.75 mm. Large, opaque, smooth, yellowish brown; nearly twice as long as wide; marginal band very narrow; surface granular; along the outer edge of this band is a row of pale yellowish, marginal fringe, slightly longer than width of band. Posterior spiracular tubercle (Fig. 1a) cylindrical, a little longer than the basal diameter; tapering slightly towards the tip; this tubercular cone is covered with short, bristly, yellow hairs of equal length; this cone is located on a very short, cylindrical neck at the base of which is a darker brown, smooth elevated ring; each spiracle (Fig. 1b) is shining, reddish yellow, much darker around the edges and a series of small reddish beads arranged in rows. For details see drawing; the button is a small, circular depression located on the inner, upper half of the spiracle; the buttons are separated by a space equal to the diameter of one buttton.

Pupa.—Like the larva with the following differences: Much more rigid and slightly darker; anterior spiracles missing. Boulder, Colorado (no date) Hazel Andrews, collector.

Microdon manitobensis Curran

Psyche, 1924, 31: 227.

Larva (Fig. 2).—Length 10 mm.; width 7.5 mm.; height 5 mm. Medium sized, dull, smooth, deep luteous with a cinnamon brown tinge; no reticulation; two marginal rows of long reddish yellow fringe; one row just above the other, separated by a distance slightly greater than the length of the fringe in the bottom row; fringe in the upper row slightly shorter, pressed against the body. Posterior spiracular tubercle (Fig. 2a) located above the margin, a distance about twice the length of the tubercle; tubercle clylindrical, broadly constricted in the middle, pale, dull, luteous with numerous small, reddish, shining dashes; from the side, the apex extends obliquely

downward; around the base numerous small, reddish ridges arranged like the teeth of a ratchet; this tubercle located on an elevated circular ring of dark reddish brown color; spiracular plates shining, reddish yellow, widely separated; each plate is more reddish along the edge, with numerous small, reddish beads arranged obliquely in groups (see drawing), the buttons are round, slightly concave, deep reddish brown; they are separated by a space equal to the diameter of one button; ventral surface of larva deep reddish yellow.

Pupa.—Like the larva with the following differences: Much more rigid, slightly darker in color. Anterior spiracles lost.

Emboro, Sask. May 28, 1915, T. E. Jewsbury, collector.

Microdon marmoratus Bigot

Ann. Soc. Ent. Fr. 1883, 3, 6 ser.: 320.

Larva (Fig. 3).—Length 7 to 8 mm.; width 6 mm.; height 3.5 to 5 mm. Medium sized, pale, dull, luteous yellow; a very narrow, granular, pale yellow, mid-dorsal line, extending from the posterior spiracles to the anterior edge; around the entire latero-ventral edge is a narrow band of small tubercles; along the entire outer edge of this band is a row of yellow bristles about as long as this band is wide. Posterior spiracular tubercle (Fig. 3b) about as long as its greatest width; located on a round, slightly elevated ring, about the length of the tubercle above the margin; from above, there is a slight constriction on each side; the sides reddish yellow, smooth, shining, transparent chitin; the central area, broader on the dorsum, dull granular, opaque area yellowish white; end view arcuate, both sides are nearly circular; each spiracle (Fig. 3c) has four slightly curved, radiating slits, each with reddish granular edges; button nearly circular, deeply depressed, separated by a space nearly equal to the width of one button.

Pupa (Fig. 3).—Like the larva, with the following differences: Much more rigid, slightly darker in color. With a pair of anterior spiracles (Fig. 3a) separated by a space equal to twice the length of one spiracle and located above the anterior edge at a distance three times as great as the length of one spiracle; each spiracle twice as long as its diameter, reddish yellow, and tapering towards the apex with a small tubercle at the tip; the basal half has numerous rounded depressions, the upper half with numerous microscopic tubercles (see drawing).

Collected in San Francisco County, California, in May.

Microdon globosus (Fabricius)

Syst. Antil, 1805, 185, no. 7.

Larva (Fig. 4).—Length 7.5 mm.; width 6 mm.; height 3.75 mm. Medium sized, smooth, dull, luteous, with no reticulations; ventral surface pale luteous, faintly shining; around the outer edge is a broad, granular, reddish

band; upon the outer edge of this band is a row of reddish yellow fringe slightly shorter than the width of the band. Posterior spiracular tubercle (Fig. 4b) a little longer than the greatest width of the outer end; this tubercle is located above the margin, a distance not quite as long as the length of the tubercle; sides of tubercle shining, semi-transparent, reddish yellow with a dark stripe around the basal portion; pale yellow between the ends of the slits; middle portion is dull, pale, luteous with numerous microscopic, reddish granules; from behind, the basal portion of the tubercle is cylindrical while the outer end is flattened transversely with a depression in the middle, forming a rounded knob on each outer end; each knob (Fig. 4c) has four slightly curved slits; the buttons are rounded depressions on the inner side of each knob, separated by a space a little greater than the diameter of each button; pale luteous and faintly shining.

Pupa (Fig. 4).—Like the larva, with the following differences: Much more rigid, darker in color. Anterior spiracles (Fig. 4a) cylindrical, slightly bent in the middle, the outer half tapering towards the tip; each spiracle about twice as long as its diameter; located above the anterior margin about three and one-half times the length of one spiracle and separated by a space nearly equal to twice the length of one spiracle; a deep yellowish red in color; the basal half with rows of small, elliptical depressions; the outer half with numerous small, granular tubercles.

Reared by C. T. Greene from larvae collected by Robert Woodbury, at Lucketts, Va. (12 miles from Leesburg), May 16, 1938, pupated May 18 to June 1, emerged June 11, 1938. Associated with the ant *Tapinoma sessile* (Say).[1]

Microdon coarctatus Loew

Centuria 1864, part V: 47.

Larva (Fig. 5).—Length 5 mm.; width 3 mm.; height 2.5 mm. Small, smooth, opaque, milky-white; on the ventral surface near the margin, but not visible from above, is a row of fine, soft, delicate fringe encircling the ventral surface. Around the margin, above the fringe is a row of thirty small cone-like yellowish brown projections; on the dorsum are numerous others of the same cone-like projections arranged in pairs; each projection is located on a small, short stem with a diameter about equal to its length; the cone portion has the basal diameter nearly equal to the height. These cones are very easily knocked off but there is always a definite scar at the point of attachment. Posterior spiracles are located on top of a large tubercular cone (Fig. 5b) which is located well above the margin; this cone is medium dark, brownish yellow, sclerotized and pointing obliquely from the ventral surface. This cone rests on a broad circular base, brownish yellow, tapering slightly upward, and at the top is a narrow, constricted

[1] Unless otherwise noted, the ants mentioned in this paper were identified by Dr. M. R. Smith.

space and then the cone; on this constriction are red, vertical, narrow ridges, resembling the teeth on a ratchet; the cone is a little longer than its basal diameter; on each side, near the middle is a round, raised, reddish bead; the surface of the cone with numerous short, very delicate, crinkly, microscopic hairs; in certain lights the surface is microscopically reticulate; the top of the cone is flattened and upon this surface are located the posterior spiracles (Fig. 5c); each spiracle has a round, raised, pointed button; radiating around this button are eight reddish slits.

Pupa (Fig. 5).—Like the larva, with the following differences: Much more rigid, pale luteous yellow. A pair of anterior spiracles (Fig. 5a) developed just above the margin; spiracles are widely separated, the space equal to twice the length of one spiracle; they are reddish in color; the surface at the base has a microscopical checkered appearance; apical half with numerous small, round tubercles scattered over the surface.

Larvae and pupae with small black ants, *Monomorium minutum* (Buckley), under bark and in decayed sapwood of a log of chestnut-oak.

Collected at Difficult Run (Arlington County) Virginia, July 4, 1916, by T. E. Snyder. Adults emerged July 10-12, 1916, Hopkins No. 12994a. Also collected at Palm Grove, Texas. Adults emerged June 4, 1917, Hopkins No. 15120a. Skyland, Va. April, 1923, W. M. Mann, collector.

In nest of the ant *Aphaenogaster fulva* (Roger) variety.

Microdon wheeleri Mann

Psyche, 1928, 35: 168.

Pupa (Fig. 6).—Length 7 mm.; diameter 2.75 mm. Elongate, very pale yellow, nearly cylindrical and very slightly smaller near the middle; smooth, no reticulation; both ends rounded. Anterior spiracles (Fig. 6a) are cylindrical, shining dark red, faintly darker near the base and a small tubercle at the tip; the surface has numerous fine depressions resembling reticulation, the depressions near the base slightly larger and deeper; these spiracles are located on the anterodorsal surface above the margin, about twice the length of one spiracle; they are separated transversely at their bases, by a space nearly equal to twice the length of one spiracle. Posterior spiracular tubercle (Fig. 6b) is blackish red in color, nearly cylindrical, slightly longer than its basal diameter, with the sides microscopically granulose and tapers slightly towards the tip; the tubercle is located on the posterior end of the pupa just above the horizontal diameter; viewed from behind, the posterior end or tip is somewhat square with the corners rounded and with deep depressions on the upper and lower sides; the two spiracular plates (Fig. 6c) are shining, reddish yellow, each plate somewhat elliptical with four finger-like projecting areas, two above and two below; the space between these pale areas is a little less than the width of one area; between

these is a slender, whitish spine, slightly curved upward; the buttons are round, deep, depressions located just above the base of this spine.

Red Tank, Canal Zone, March 27, 1923. Dr. W. M. Wheeler, collector. Pupa collected in nests of *Crematogaster* (*Orthocrema*) *brevispinosa* Mayr. subspecies *tumulifera* Forel in *Cordia alliodora* Ruiz and Pavon.

Microdon pictipennis (Macquart)

Dipt. Exot. 1850, Suppl. 4, part 1, p. 433, pl. 12, fig. 12.

Larva (Fig. 7).—Length 7 mm.; width 5.5 mm.; height 2.85 mm. Medium sized, dull, luteous, without reticulation; the entire upper surface of the larva with numerous small, rounded, reddish tubercles (Fig. 7b) about as long as their diameter; each tubercle slightly shining, microscopically granulose; ventral surface pale luteous with a faint reddish tinge; marginal band slightly roughened; along the outer edge is a closely set whitish fringe, a little longer than the width of the band. Posterior spiracular tubercle (Fig. 7c) located above the margin, a distance about one and one-half times the length of the entire tubercle; the basal half of the tubercle spherical, dull, luteous, with numerous small, flattened, tubercles; the outer half is bifid, deep, shining, yellowish red; each fork is covered with numerous minute, tubercles arranged in rows; on the tip of each fork is located a spiracle (Fig. 7c); the center has a rounded, roughened, depression and along the edge of the fork are eleven curved slits extending slightly upon the side of the fork.

Pupa (Fig. 7).—Like the larva, with the following differences: Much more rigid, darker in color. Anterior spiracles (Fig. 7a) cylindrical, shining, yellowish red, located above the anterior margin, about twice the length of one spiracle; they are separated by a space about one and one-half times the length of one spiracle; each spiracle is little more than three times as long as the basal diameter; basal half granulose, with the granules arranged in rows; the outer half slightly larger in diameter, tapering slightly at the tip; surface smooth with numerous small, pointed, tubercles.

Hobart, Tasmania, A. M. Lea, collector (no date).

Microdon Species # 3

Larva (Fig. 8).—Length 7 mm.; width 5 to 5.9 mm.; height 3.5 mm. Dull, pale, luteous with dark brown, granulose, reticulation; ventral surface dull, pale, luteous; marginal band flat, narrow, granular; around the outer edge is a row of yellowish white fringe. Posterior spiracular tubercle (Fig. 8a) located above the margin, about twice the length of the tubercle which is circular at the base and somewhat quadrate at the tip; slightly wider than long; the surface is finely granulose. Posterior spiracle (Fig. 8b) located on the outer portion of this tubercle; each spiracular plate is smooth, pale, yellowish, with large, broad, sinuose area with five small finger-like

branches on the lower half, one on the outer side above the middle and two more at the top; this pale spiracular area has numerous small, bead-like openings around the edge; the button is small, circular, concave, located near the upper, inner branch of the spiracle. Ventral surface of larva dull, pale, luteous.

Topeka, Kansas, October, 1933, C. H. Popenoe, collector.

Microdon Species # 4

Pupa (Fig. 9).—Length 6 to 8 mm.; width 3 to 3.5 mm.; height 2.5 to 3 mm. Smooth, dull, deep reddish yellow with a row of pale yellowish bristless along the latero-ventral edge. Each side of the pupa has two longitudinal rows of six rounded clusters of short, yellowish, spine-like bristles (Fig. 9b), each cluster on a faintly raised elevation. Anterior spiracle (Fig. 9a) located between the first and second clusters of bristles in the upper row; this spiracle is about twice as large as its diameter and slightly darker colored towards its apex; there are several large tubercles on the apical third with several smaller tubercles on the anterior surface; basal two-thirds of spiracle is microscopically reticulate. Posterior spiracle (Fig. 9c) cylindrical, about one and one-half times as long as its diameter; a narrow basal portion is slightly constricted; the large central portion dull, reddish, vertically rugose; apical portion shining, more reddish, with numerous very small, elliptical slits on the apical surface.

Beverley, West Australia, J. Clark, collector (no date).

In nest of ant *Iridomyrmex rufoniger* Lowne (Ident. by J. Clark.)

Microdon ruficrus Williston

Synop. N. A. Syrph. 1886, p 7.

Larva (Fig. 10).—Length 85 mm.; width 6.75 mm.; height 4 mm. Medium sized, dull, yellowish red; ventral surface pale luteous; marginal band with the dorsum covered with minute tubercles, arranged in transverse rows; around the edge of this band are twenty-two pencils of long bristles located at regular intervals; the anterior pair and the two posterior pairs are smaller and closer together; between these pencils is a row of short, yellowish fringe; in the middle of the dorsum are three broad, longitudinal bands extending forward from the posterior spiracular tubercle; the middle band reaching about three-fourths the distance to the anterior edge, the other two extending about two-thirds the distance; these bands are separated by spaces of about the same width as one band; each side and across the anterior portion the dorsum is definitely reticulated. Posterior spiracular tubercle (Fig. 10a) located above the margin, a distance nearly equal to the width of the tubercle; viewed from behind, this tubercle is raised in the middle of the dorsum, with a shallow depression on each side; the surface is covered with numerous small, reddish yellow tubercles; each spiracle

(Fig. 10b) is pale reddish yellow with seven lobes, three above and four below; these lobes are more reddish along the edge; each lobe has a series of small reddish beads along the edge; inner edge of spiracular plate has a deep, rounded, emargination; the buttons are large, circular concavities and separated by a space equal to the diameter of one button.

Pupa.—Like the larva, with the following differences: Much more rigid, slightly darker in color. Anterior spiracles lost.

Clark's Valley, Pa. (no date), collected by A. B. Champlain.

Microdon champlaini Curran

Kans. Univ. Sci. Bull. 1925, 15: 71.

Larva (Fig. 11).—Length 8 mm.; width 5.5 mm.; height 3.5 mm. Medium sized, dull, smooth, cinnamon brown; reticulation is composed of irregular, roughened, granules; ventral surface reddish yellow, a little paler than the dorsum; marginal band narrow with an irregular row of very small granules, each of which bears a short, yellow, bristle; marginal fringe yellow, as long as the width of the band. Posterior spiracular tubercle (Fig. 11a) located above the margin, a distance slightly more than the length of the tubercle; this tubercle is cylindrical, about as long as its diameter, slightly concave above and below near the outer end; it is yellowish red with very minute tubercles above, and larger ones on the sides; it joins the body by a very short neck of a little smaller diameter and more reddish in color; the tubercle is located on a rounded area faintly elevated; spiracular plates (Fig. 11b) are shining, pale yellow in the middle and deep reddish around the edges; along the edges of the yellow portions are a series of small reddish beads; between the plates is a vertical concavity on each side of the center of which are the circular, concave, buttons which are separated by a space a little more than the diameter of one button.

Pupa (Fig. 11).—Like the larva, with the following differences: Much more rigid, slightly darker in color. Anterior spiracles lost.

Harrisburg, Pa. no date, A. B. Champlain, collector, and Linglestown, Pa. June 14, 1920, A. B. Champlain and J. N. Knull, collectors.

Microdon Species # 2

Larva (Fig. 13).—Length 11 mm.; width 8 mm.; height 3 mm. Dull, dark yellowish red with irregular reticulations, made up of rounded tubercles, each with a sharp spine at the tip (Fig. 13a); ventral surface dull, reddish, luteous; marginal band is broad, flat, slightly paler, with numerous tubercles slightly longer than their diameter; around the edge of this band is a row of short, yellowish-white fringe. Posterior spiracular tubercle (Fig. 13b) located above the margin a distance about one and one-fourth times the length of the tubercle; from behind it is somewhat quadrate, slightly broader at the base; around the edge is a ruff; on the upper half is another ruff

which disappears at the middle on each side; the spiracular plates pale, reddish yellow; each plate has four lobes on the lower half and two large, rounded lobes at the upper end; the small, elliptical, pale-yellow spiracular openings are arranged in double rows (Fig. 13a); in the central portion of the plate the openings are much larger; between the two posterior plates is an elevated ridge with an enlarged, granular swelling at the upper end and a smaller enlargement at the lower end.

Ashburn, Ga. R. 2, September 23, 1929, F. R. Knight, collector.

Microdon Species # 1 (near **robusta** Telford)

Larva (Fig. 14).—Length 10 mm.; width 7 mm.; height 4 mm. Dull, dark, yellowish red with irregular reticulation, made up of small tubercles, slightly concave on the tip; ventral surface dull, reddish yellow; marginal band is broad, flat, granulose; around the edge of this band is a row of short, pale, yellow fringe with a length about one-fourth the width of the band; a reticulated ridge encircling the edge of the larva has a small tubercle in the middle of each reticulated area; in the middle of the dorsum is a longitudinal ridge extending from the posterior spiracular tubercle forward, for about three-fourths the distance to the anterior end of the larva; this ridge is reticulated with a small tubercle in the middle of each of most of the reticulated areas. Posterior spiracular tubercle (Fig. 14a) is located above the margin, a distance about equal to the length of the tubercle; this tubercle is slightly longer than broad, covered with granular tubercles, some of which are longer than others (Fig. 14c), the spiracular plates (Fig. 14b) are smooth, deep red with blackened edges; they are separated by a space nearly equal to the width of one plate; the spiracular openings are arranged in four yellowish-red bands with small, yellowish bead-like areas on each side; between the two spiracular plates is a short, thick spine; below the plates is a transverse depression; below this depression the tubercles are flattened and spinulose (Fig. 14c).

Mariposa Big Tree Grove, California, no date. Larva from rotten wood. W. H. Dall, collector.

Microdon robusta Telford

Univ. Minn. Agr. Exp. Sta. Bull. 140, 1939, p. 14.

Larva (Fig. 15).—Length 11.5 mm.; width 6.75 mm.; height 3.75 mm. Deep yellowish red, with the two longitudinal areas, between the middle ridge and the lateral ridge, more luteous; reticulation small, the lines made up of small, rounded elevations, each with a spine at the tip (Fig. 15a); ventral surface pale luteous, faintly reddish; marginal band broad, finely granulose; along the edge of this band is a row of yellowish-white fringe; a broad, marginal, rounded ridge with reticulations; in the middle of the dorsum is a broad, rounded ridge, extending longitudinally from the spiracular tubercle almost to the anterior end of the larva; anterior end of this

ridge sloping downward and fading out. Posterior spiracular tubercle (Fig. 15b) located just above the margin from behind, the tubercle nearly circular and from either side, the apical half of the tubercle is of a slightly smaller diameter than the base; the surface is covered with small, slender tubercles, those on the basal half of the tubercle each with a minute spine at the tip; the spiracular plates (Fig. 15c) reddish yellow, somewhat elliptical, about two and one-half times as long as wide, the ends broadly rounded and on the outer side of each plate, at the middle, it is slightly rounded; on each plate is a series of elliptical bead-like openings; buttons are circular depressions located along side and just above the middle of each plate; between the spiracular plates are two large tubercles, one above the other; each tubercle has several pointed, prong-like projections at the tip.

Pupa (Fig. 15).—Like larva, with the following differences. Much more rigid, darker in color. The anterior spiracles were lost.

Mosherville, N. Y. April 13, 1893. From a poplar log. Collector unknown. Lyme, Conn. October 30, 1915, A. B. Champlain, collector.

Found in a nest of the ant *Camponotus herculeanus* sub-species *pennsylvanicus* (DeGeer), Hopks. U. S. No. 12977*m*.

Microdon megalogaster Snow

Kans. Univ. Quart., 1893, I: 34.

Larva (Fig. 16).—Length 10.5 mm.; width 8 mm.; height 5.75 mm. Large, dull, brownish red with the surface faintly reticulate; venter deep reddish; two rows, one above the other, of reddish yellow, crinkly marginal fringe. Posterior spiracular tubercles (Fig. 16b) prominent and forked at the apex, located just above the margin; the tubercle is round, with concave sides, the smaller diameter in the middle; it is located on a circular elevation, only slightly raised above the surface; where the tubercle joins this elevation is a row of small, sharp ridges encircling the base, these ridges resemble the teeth in a cog or ratchet; the surface of the tubercle is a dull, brownish yellow with fine, transverse, red lines or dashes; transversely across the apex the small red dashes are much broader and more prominent; the buttons are circular depressions separated by a space about equal to the diameter of the button; the stigmal plates (Fig. 16b) are reddish yellow, shining, much wider at the base than at the apex; they are separated by a space a little more than the width of one plate; there are numerous small, elliptical ridges or elevations upon the surface of each spiracular plate; upon each small ridge is locatd a longitudinal slit (Fig. 16b).

Pupa (Fig. 16).—Like the larva, with the following exceptions: Much more rigid; color slightly darker; anterior spiracles (Fig. 16a) located above the margin a distance about three and one-half times as long as one spiracle; separated by a space about equal to four times the height of one

spiracle; height of each spiracle about equal to one and one-half times the diameter; spiracles are cylindrical, dark red and deeply reticulate on the sides; apical surface a little more yellowish with numerous close set cone-shaped tubercles. See drawing Fig. 16a.

Larva collected at Falls Church, Va. May 5, 1922, pupated May 6 and adults emerged May 17, 1922. C. T. Greene, collector.

Found in nest of the ant *Formica fusca,* subspecies *subsericea* Say.

Skyland, Va. April, 1923, W. M. Mann, collector.

Pupa in nest of ant *Formica fusca* (L.) variety.

Whitetop Mt. Va. June 15, 1915, C. T. Greene, collector.

Pupa in nest of ant *Formica fusca* var. *subgenescens,* Hopks. U. S. No. 12893.

Microdon cothurnatus Bigot

Syn. N. A. Syrph., 1886, p. 8.

Larva (Fig. 17).—Length 8 to 11 mm.; width 6 to 8 mm.; height 4 to 5 mm. Medium to large sized, dull, dark, yellowish brown; reticulation well defined, the lines composed of fine granules; marginal band broad, having the upper surface granular, arranged in transverse rows; marginal fringe reddish yellow, about as long as the width of the band; venter flat, pale luteous. Posterior spiracular tubercle (Fig. 17b) located above the margin about the length of the tubercle; it is one and one-half times as wide as long; on the dorsum, the central basal portion is elevated, with a faint depression on each side; around the base of this tubercle is a row of short ridges, resembling the teeth in a ratchet; this tubercle is dull, luteous, the surface is covered with scale-like projections which are microscopically roughened along the upper edges; the tubercle is located on an elevated, dark, red ring; from behind, on the tip of the tubercle are the spiracular plates separated by a space almost equal to the width of one plate, each plate (Fig. 17c) is shining yellowish red, with nine small lobes along the outer edge; five lobes above and four below; each lobe has a series of small, bead-like openings or slits (see drawing); the buttons are circular, deeply concave and separated by a space about one and one-half times the diameter of one button; below the buttons is a silght depression.

Pupa (Fig. 17).—Like the larva, with the following differences. Much more rigid, darker in color. Anterior spiracles (Fig. 17a) are cylindrical, tapering slightly towards the tip; the length is about equal to the basal diameter; yellowish red, with the basal half smooth and with numerous very small tubercles on the tip; spiracles are separated by a space about seven times the diameter of the spiracle; they are located above the anterior margin, a distance equal to about ten times their diameter.

North Cheyenne Canyon, Colorado Springs, Colo. A. B. Champlain, collector. Adults emerged from April 24 to May 18, 1914. Lyme, Conn. reared May 28, 1918, A. B. Champlain, collector.

Larkspur, Douglas Co. Colorado. April 12, 1914, larvae in dead stump of *Salix* sp. A. B. Champlain, collector.

All above reared by C. T. Greene.

Microdon tristis Loew

Synop. N. A. Syrph. 1886, p. 6.

Larva (Fig. 18).—Length 8.5 to 9 mm.; width 6.5 mm.; height 3 mm. Dull, reddish yellow with an irregular, granular, reticulation; marginal band broad, granulose; on the outer edge of this band is a row of yellowish fringe, each strand is broader at the base and about as long as the width of the band; below this band, is a second row of fringe, similar to those described above; venter deep reddish yellow. Posterior spiracular tubercle (Fig. 18b) located above the margin, a distance about twice the length of the tubercle; this tubercle is a little broader than long with a depression on each side; the surface is covered with small, slightly flattened, granulose tubercles; from behind, there are two broad, elliptical, flattened areas, rounded on their edges with a central, vertical depression separating these two areas; each area represents a posterior spiracular plate (Fig. 18c) with several broad, pale, yellow areas radiating out from the center; between each pale area is a darker, pointed depression; each pale area has a row of small, paler yellow, rounded beads; each spiracular plate has two pale yellow bristles near the base and one on the upper, inner surface; the buttons are circular depressions separated by a space about one and one-half times the diameter of one button; they are located in the depression between the two spiracles and are slightly above the horizontal diameter.

Pupa (Fig. 18).—Like the larva, with the following differences: Much more rigid, darker in color. Anterior spiracles (Fig. 18a) are cylindrical, slightly curved, yellowish red, tapering slightly towards the tip; each spiracle is about two and one-half times as long as its diameter; base with short, narrow, faint, longitudinal ridges with numerous small, pointed tubercles on the surface; located above the anterior, latero-ventral edge about two and one-half times the length of one spiracle; they are separated by a space nearly twice as long as one spiracle.

Reared to the adult stage by C. T. Greene, from a larva found in a chestnut stump, North of the District of Columbia line, Wash. D. C. March 28, 1920, A. N. Caudell, collector.

Microdon piperi Knab.

Proc. Biol. Soc. Wash., 1917, 30: 136.

Larva (Fig. 19).—Length 10 mm.; width 7 mm.; height 4 mm. Medium sized, dull, yellowish red; marginal band broad; the dorsum covered with minute tubercles, arranged in transverse rows along the outer edge of this band is a row of yellowish fringe, each strand is thicker at its base; entire dorsum distinctly reticulated, the lines of reticulation made up of small tubercles, each with a small depression at its summit; venter flat, very pale luteous. Posterior spiracular tubercle (Fig. 19b) located above the margin, about the length of the tubercle; the basal portion is rounded, covered with numerous yellowish bristles; this basal portion is located on a very short, cylindrical, neck which has numerous short ridges like the teeth in a ratchet; there is a flat, circular, dark red ring at the base; the spiracles are elevated about the height of one spiracle (Fig. 19c), flattened across the top; in an end view each spiracle is rounded, with a deep depression below; deep yellowish red with the slits orange color; buttons round, deeply concave and close together.

Pupa (Fig. 19).—Like the larva, with the following differences: Much more rigid, slightly darker. Anterior spiracle (Fig. 19a) shining, deep yellowish red; slightly longer than its diameter at base; basal half strongly reticulate; upper portion with numerous small, rounded tubercles; spiracles located above the anterior margin a distance about four times as long as one spiracle, separated by a space equal to three times the length of one spiracle.

Seattle, Washington. An adult emerged April 27, 1901, C. V. Piper, collector.

Mixogaster variegata (Walker)

Insecta Saundersiana, Dipt. 1856, I: 220. Syn. *Microdon daveyi* Knab. Trans. Roy. Soc. So. Austr., 1912, 36: 233.

Pupa (Fig. 12).—Length 8 to 9 mm.; width 4.5 to 5 mm.; height 3 mm. Medium sized, pale, shining, luteous; reticulation distinct; the reticulated lines are formed by microscopic, scale-like, white hairs; a broad, V-shaped, longitudinal groove in the middle of the dorsum, extending from the posterior spiracular tubercle to the anterior edge of the pupa; each small area within the reticulated lines depressed in the middle; marginal rounded ridge (Fig. 12b) is covered with small tubercles arranged in transverse rows; each tubercle has three microscopic bristles at the apex; underneath this ridge is a single row of microscopic white bristles extending around the entire pupa.

Anterior spiracles (Fig. 12a) dark reddish brown, faintly shining, with the entire surface microscopically granular; about one and one-half times as long as its basal diameter, tapering very slightly toward the tip; basal half with several longitudinal ridges, fading out at their tips, separated by a space about as wide as one ridge; on the tip of the spiracle are several small blackish beads with a narrow pale yellow slit in the middle; these beads

arranged in a double row with space between pale yellow. Posterior spiracular tubercle (Fig. 12c) located above the margin about the length of the tubercle; the tubercle is about twice as long as the basal diameter; slightly concave beyond the middle and with a longitudinal depression on each side of the basal half, causing a prominent ridge in the middle of the basal half of the dorsum; the surface is microscopically granular with a frosted white coating; apical portion (Fig. 12d) is shining, yellowish red and quite rough looking on the tip; on the outer side of each half are five small, nearly round, shining bead-like elevations (Fig. 12e) each with a central, longitudinal spiracular slit; the buttons are circular concavities separated by a space equal to the diameter of one button.

Ararat, Victoria, Australia, no date. H. W. Davey, collector. From ants nest, (name not given).

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Explanation of Figures

(All drawings by C. T. Greene)

(All drawings are dorsal views except No. 9 which is the lateral view)

Fig. 1.—*Microdon lanceolatus* Adams. Pupa, *a.* posterior tubercle; *b.* posterior spiracular plate.

Fig. 2.—*Microdon manitobensis* Curran. Pupa, *a.* posterior spiracular tubercle; *b.* posterior spiracular plate.

Fig. 3.—*Microdon marmoratus* Bigot. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plates.

Fig. 4.—*Microdon globosus* (Fabr.) Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 5.—*Microdon coarctatus* Loew. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 6.—*Microdon wheeleri* Mann. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 7.—*Microdon pictipennis* (Macq.) Pupa, *a.* anterior spiracle; *b.* dorsal tubercle; *c.* posterior spiracular tubercle; *d.* post. spiracular plate.

Fig. 8.—*Microdon* Species No. 3. Larva, *a.* posterior spiracular tubercle; *b.* posterior spiracular plate.

Fig. 9.—*Microdon* Species No. 4. Pupa, lateral view, *a.* anterior spiracle; *b.* lateral tubercle; *c.* posterior spiracular plate.

Fig. 10.—*Microdon ruficrus* Williston. Pupa, *a.* posterior spiracular tubercle; *b.* posterior spiracular plate.

Fig. 11.—*Microdon champlaini* Curran. Pupa, *a.* posterior spiracular tubercle; *b.* posterior spiracular plate.

Fig. 12.—Mixogaster variegatus (Walker). Pupa, *a.* anterior spiracle; *b.* section thru latero-ventral band; *c.* poster spiracular tubercle; *d.* end view of posterior spiracular tubercle; *e.* posterior spiracular plate.

Fig. 13.—*Microdon* Species No. 2. Larva, *a.* enlargement of a reticulated line; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 14.—*Microdon* Species No. 1. Larva (near *robusta* Telford); *a.* posterior spiracular tubercle; *b.* posterior spiracular plate; *c.* enlarged view of one of the lower tubercles.

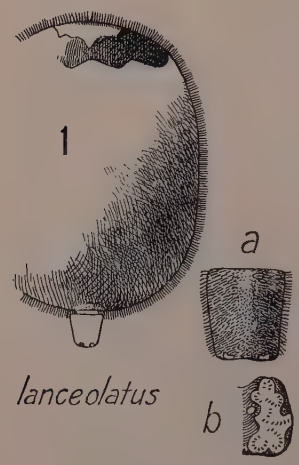
Fig. 15.—*Microdon robusta* Telford. Larva, *a.* enlargement of a reticulated line; *b.* posterior view of the spiracular tubercle; *c.* posterior spiracular plate.

Fig. 16.—*Microdon megalogaster* Snow. Pupa, *a.* anterior spiracle; *b.* posterior spiracular plate.

Fig. 17.—*Microdon cothurnatus* Bigot. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 18.—*Microdon tristis* Loew. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.

Fig. 19.—*Microdon piperi* Knab. Pupa, *a.* anterior spiracle; *b.* posterior spiracular tubercle; *c.* posterior spiracular plate.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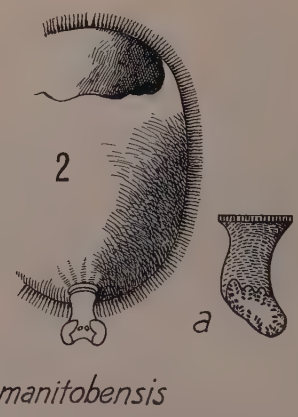
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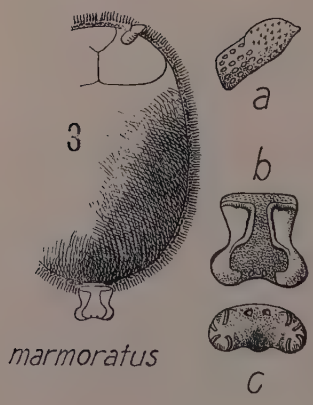
manitobensis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marmoratus

marginal fringe
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4
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spiracular tubercle
globosus
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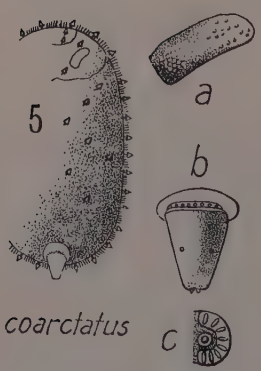
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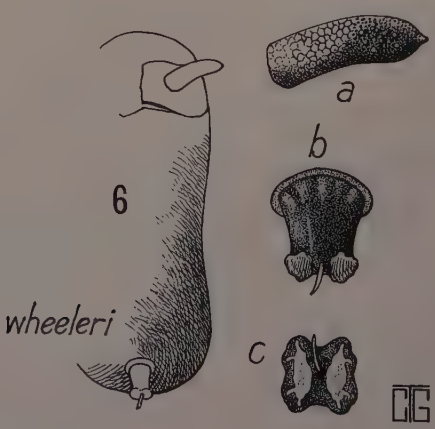
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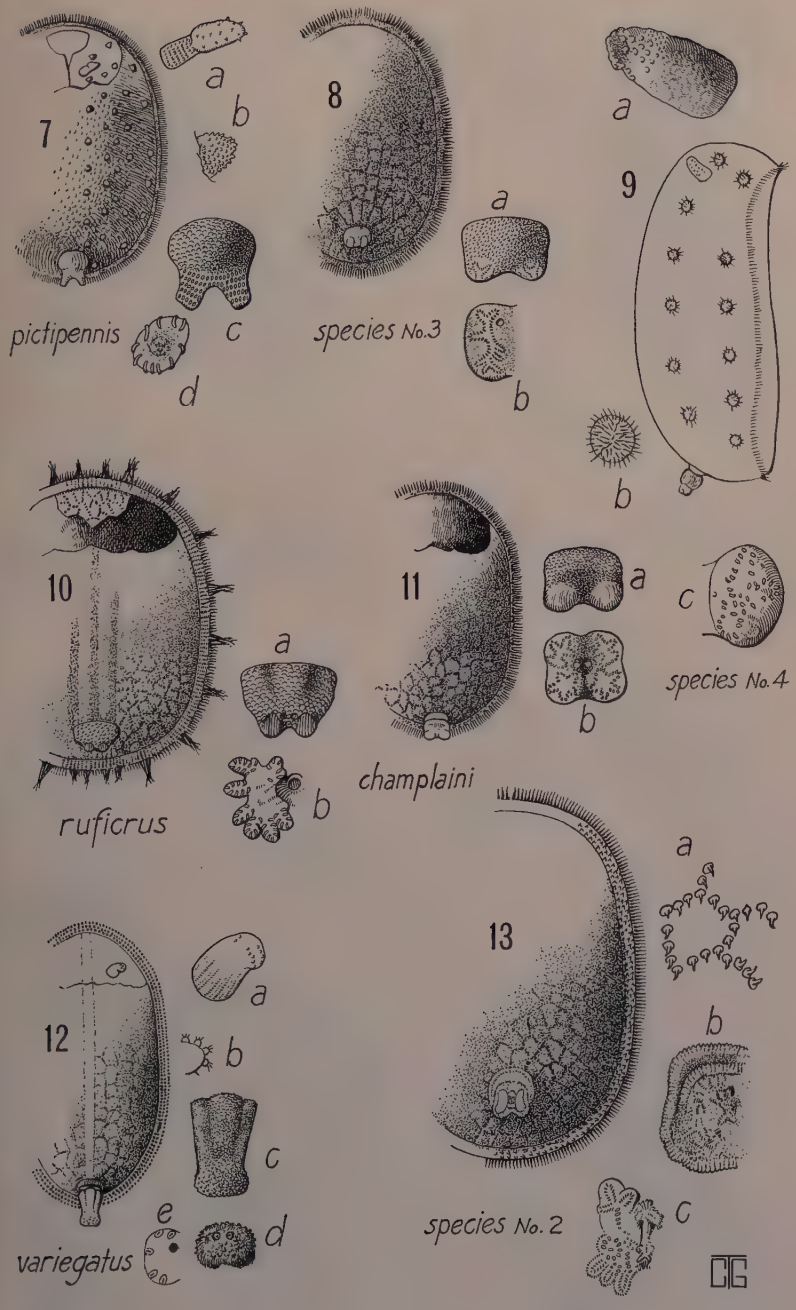
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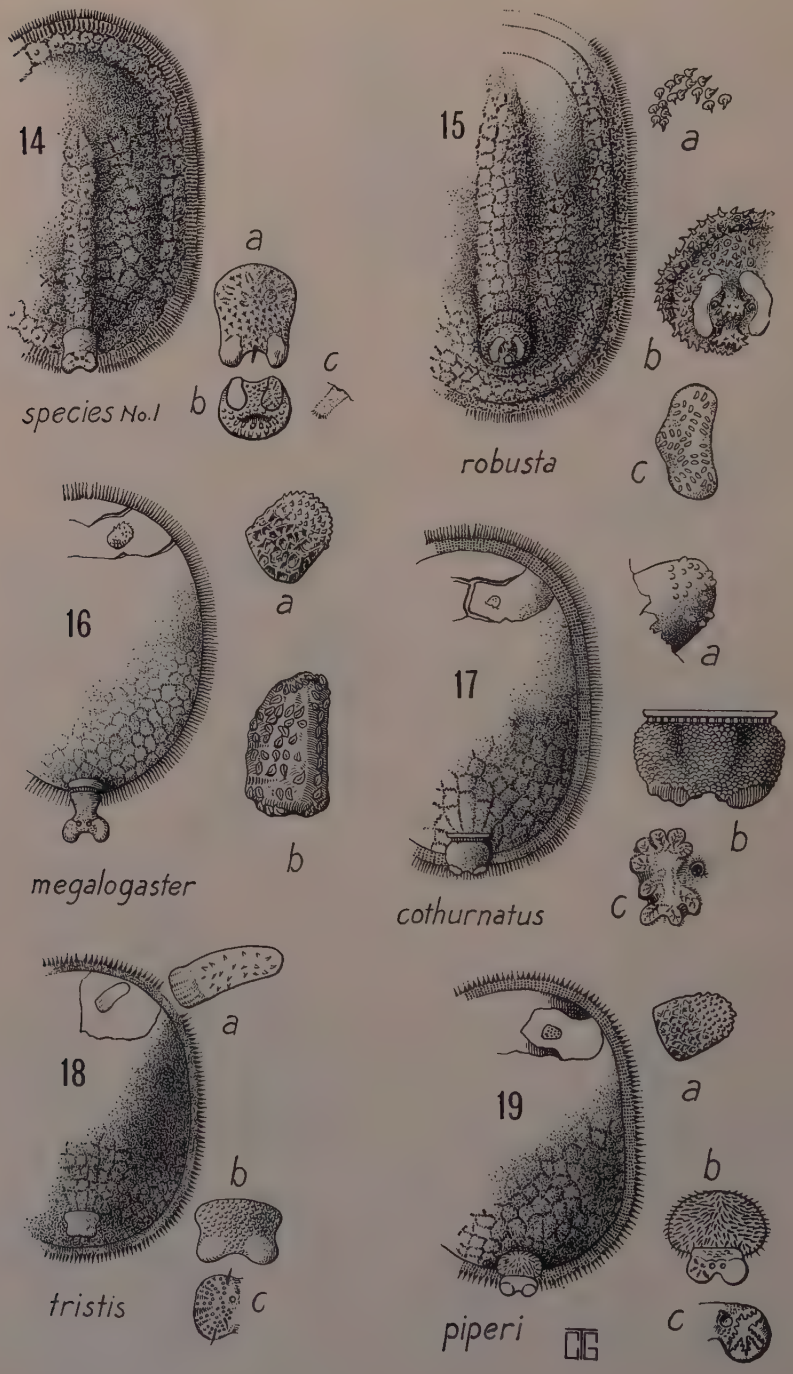
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cothurnatus
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a
b
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tristis
19
a
b
c
piperi

ON SOME GERSTAECKER TYPES OF NEOTROPICAL ORTHOPTERA. II. ACRIDIDAE (part)

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A prefatory explanation of this series of studies will be found in Part I, recently published in these "Transactions."[1] In the present section there will be treated certain Gerstaecker species belonging to several genera of the subfamilies Romaleinae and Cyrtacanthacridinae. Other species of both subfamilies will be discussed in subsequent sections. In the analysis of the genera here considered, it has been necessary to bring into the discussions certain genera described by other authors, and to which affinity of some of Gerstaecker entities has been stated to exist by various workers, who, however, were unacquainted with the Gerstaecker material. These genera are *Legua* Walker and *Episcopotettix* Rehn.

ROMALEINAE

PRORHACHIS Scudder

1875. *Prorhachis* Scudder, Proc. Boston Soc. Nat. Hist., XVII, p. 269.
1898. *Xomana* Giglio-Tos, Bollett. Mus. Zool. Anat. Comp. Torino, XIII, no. 311, pp. 40, 51. (In part, and synonymy established by first citation of a genotype by Kirby, 1910.)

Genotype (by monotypy).—*P. granulosa* Scudder.

When Giglio-Tos erected his genus *Xomana* he included in it two species, for which he gave a key, these being Gerstaecker's *Procolpia* (*Prorhachis*) *gonagra* and *Procolpia nuptialis,* the types of both of which are discussed below, but apparently he had examined material of only *nuptialis.* However, he failed to designate a genotype, and the first subsequent fixation is that of Kirby,[2] who gave that position to *gonagra* of Gerstaecker. Unfortunately we now know that *Prorhachis gonagra* is a synonym of Scudder's genotypic *Prorhachis granulosa,* being based on the opposite sex.

[1] Trans. Amer. Entom. Soc., LXXX, pp. 119-128 (1955).

[2] Synon. Catal. Orth., III, p. 363 (1910).

While Giglio-Tos makes evident in his key that he regarded his genus *Xomana* as having an elevated prozonal crest, he included in his presentation of the genus [3] a species, i.e. *gonagra,* which has a very low prozonal crest, together with *nuptialis,* which has one very well developed. If Kirby had indicated the latter species the name *Xomana* would hold for a generic entity. By mischance the selected genotype does not answer either Giglio-Tos' key characterization or his more detailed generic description, as he apparently knew *gonagra* only from the literature, and the two included species definitely are not congeneric. Under the circumstances, however, there is no alternative but to sink his *Xomana* as a synonym of *Prorhachis* Scudder, and to supply a new name for, as well as recharacterize, the generic entity which includes Gerstaecker's *nuptialis,* as has been done on a subsequent page.

The relationship of *Procolpia* and *Prorhachis* has never been set forth from the basis of authentic material, nor have their differences from the generic entity here named *Xomacris.* With representatives of all three genera, and type material of two of them, before me this is now possible. All three agree in certain characteristics, such as the produced fastigia, ensiform antennae, exceptionally elongate spines of the internal margins of the caudal tibiae, all of which, however, are shared with other genera of this section of the subfamily. However, these three genera further agree in having the medio-dorsal carina of the distal extremity of the caudal femora developed into an elevated lamellation, which distad has an angulate apex as seen in profile. Giglio-Tos, in his 1898 key to the South American genera of what he then called the "Acridinae" (the Romaleinae and Cyrtacanthacridinae as now understood), erred in placing *Procolpia* as a genus lacking such a type of femoral lobation.[4] It is probable he never knew the genus from material, except for the rather aberrant *P. minor.* I have before me a pair of *Procolpia emarginata* (Serville), the genotype, from Brazil, the female specifically from Estaçao Piassaguera, State of São Paulo,[5] and the type material of Gerstaecker's *gonagra* and

[3] Vide supra, p. 51.

[4] Bollett. Mus. Zool. Anat. Comp. Univ. Torino, XIII, no. 311, p. 41.

[5] Recorded by Rehn in 1918 (Trans. Amer. Entom. Soc., XLIV, p. 199).

nuptialis, which have been physically compared with the type of Scudder's *Prorhachis granulosa,* in the collection of the Museum of Comparative Zoology.

It is now evident that *Procolpia* and *Prorhachis* are more nearly related to one another than either is to *Xomacris,* here described. However, the two former genera are quite distinct and separable, and *Xomacris,* which is most strikingly different in its general features, agrees in some respects with *Procolpia* and in others with *Prorhachis.* Succinctly the chief features of these genera are as follows:

Procolpia (ex *emarginata*)

Fastigium conically produced, as seen from dorsum, longer than its proximal breadth in both sexes, its lateral margins serrulate or without a decided median tooth. Antennae decidedly ensiform and markedly broadened proximad. Pronotum distinctly longitudinal as seen from dorsum, appreciably compressed, median carination well marked and subtectate, but not at all cristate. Apices of tegmina sharply oblique concavo-truncate.[6] Male subgenital plate strongly produced and attenuately conical as seen in profile. Ovipositor valves of female with distal section of ventral pair attenuate as seen from venter.

Prorhachis (ex *granulosa*)

Fastigium lanceolately produced, as seen from dorsum, longer than its proximal breadth in both sexes, its lateral margins with a well-marked tooth at the middle of their length. Antennae less decidedly ensiform, and not as broadened proximad. Pronotum less longitudinal, broader as seen from dorsum, much less compressed, median carination well marked, low cristate and weakly trilobate on the prozona in the female. Apices of tegmina acuminate, not at all sharply oblique concavo-truncate. Male subgenital plate moderately produced and in profile but moderately conical. Ovipositor valves of female with distal section of ventral valves very abbreviate as seen from venter.

Xomacris (ex *nuptialis*)

Fastigium trigonally produced, as seen from dorsum, broader proximad than long in both sexes, its lateral margins undulate. Antennae essentially as in *Prorhachis.* Pronotum shorter and

[6] This is much less evident in *P. minor.* This species is being discussed in another contribution now in press.

broader than in *Prorhachis,* hardly at all compressed; median carination strongly trilobate-cristate on the prozona, on metazona tuberculato-carinate. Apices of tegmina oblique concavo-truncate. Male subgenital plate much as in *Prorhachis.* Ovipositor valves as in *Prorhachis.*

All three genera have Brunner's organ well developed. Of the three, *Procolpia* is the most widely distributed, extending well north of the Isthmus of Panama, while neither *Prorhachis* nor *Xomacris* are as yet known to range north of Amazonia or the Guianas. Discussions of the species of the genus *Procolpia* by the author are appearing in another study.

Of the genus *Prorhachis* I have before me three species, the genotype (*granulosa*) and two undescribed forms, which are being characterized elsewhere. These show that the genus is distributed over a considerable area of South America, extending from the Guianas to the Peruvian Amazon, and southward to eastern Bolivia.

Prorhachis granulosa Scudder (Plate I, fig. 1; pl. II, fig. 11.)

1875. *Prorhachis granulosa* Scudder, Proc. Boston Soc. Nat. Hist., XVII, p. 269. [♂; "Eastern slope of the Peruvian Andes." [7]]

1889. *Procolpia* (*Prorhachis*) *gonagra* Gerstaecker, Mittheil. Naturwiss-Ver. Neu-Vorpomm, und Rügen, Greifswald, XX, p. 6. [♀; Fonteboa, Amazonas [, Brazil].]

The unique type of Gerstaecker's *gonagra* has been physically compared with the similarly unique one of Scudder's *granulosa,*[8] and with a Yurimaguas, Peru, male [9] in the Academy series, and all are found to be specifically inseparable, the two types representing the opposite sexes. Except for lacking one antenna, the extreme tip of the other, a few distal tarsal articles, and the apex of the right tegmen, the Gerstaecker type is complete, and is here figured, together with the Yurimaguas male from the Academy series. The measurements of these specimens are as follows:

[7] On page 257 of the same contribution Scudder states that the material so labelled "was obtained on the road up the Andes, between Yurimaguas on the Huallaga x x x to Chachapoyas, via Balsa Puerto and Moyobamba."

[8] Labelled "Peruvian Andes. Scudder's type 1875. Type no. 15796" [M.C.Z.].

[9] Yurimaguas, Huallaga River, Peru; IV, 6, 1920; (H. S. Parish).

	Length of body	Length of antenna	Length of fastigium cephalad of eyes	Length of pronotum	Length of tegmen	Length of caudal femur
♀, Fonteboa, Amazonas, Brazil, *type* of *gonagra*	43.0	16.7[10]	3.4	11.0	43.5	23.0
♂, Yurimaguas, Peru	27.7	16.3	2.2	6.1	27.6	15.3

XOMACRIS new genus

1889. *Procolpia* Gerstaecker, Mittheil. Naturw. Ver. Neu-Vorpomm. und Rügen, Greifswald, xx, p. 7. (Not of Stål, 1873.)

1898. *Xomana* Giglio-Tos, Bollett. Mus. Zool. Anat. Comp. Torino, xiii, no. 311, pp. 40, 51. (In part, see discussion under *Prorhachis*.)

Genotype (here designated).—*Procolpia nuptialis* Gerstaecker.

The nomenclatural situation of *Xomana* Giglio-Tos has been discussed on a preceding page. The present genus, as already noted, is closely related to *Prorhachis* Scudder but well distinct, and can readily be separated by the following outstanding features: fastigium trigonally produced as seen from dorsum, but broader at its base than long, its lateral margins undulate, prozona of pronotum strongly trilobate-cristate, tegmina with apices obliquely concave-truncate. As Giglio-Tos' description of *Xomana* (his page 51) was composite, it seems desirable to present a new one.

Generic description.—Fully alate. Surface of head and pronotum, and of much of sternum and caudal femora with papillose, contrastingly colored tubercles. Head relatively short; fastigium with dorsal surface horizontal, less produced than in related genera, as seen from the dorsum with its proximal breadth greater than its length, broad trigonal in outline, apex entire; frontal costa not strongly marked, narrow, shallowly sulcate, passing into the non-sulcate inter-antennal rostrum briefly dorsad of the median ocellus; eyes prominent, elliptical in basal outline. Antennae moderately elongate, exceeding the combined length of the head and pronotum, weakly ensiform proximad in the male, somewhat more strongly so in the female. Pronotum short and relatively broad, median carina elevated in the prozona into a sublamellate tridentate crest, its component parts separated by the transverse sulci and each in dorsal outline trigonal, the second of the three the highest, median carina of metazona much lower, but with a distinct subtrigonal lobule at the middle of its length; cephalic margin of pronotal disk with a marked median strumose area which passes into the prozonal crest and is itself broadly trigonal-emarginate on the median

[10] Tip missing.

line; caudal margin of pronotal disk rectangulate-produced with the sides of the angle shallowly but distinctly concave. Tegmina elongate and narrow, surpassing the apex of the abdomen by a distance greater than the pronotal length, very slightly narrowing distad in the female, this hardly evident in the male, apex obliquely concavo-truncate. Wings ample, with apices narrowly and subobliquely truncate, as with the tegmina. Prosternum with erect aciculate process. Mesosternal interspace subequal to (♂) or faintly narrower than (♀) one of the mesosternal lobes. Supra-anal plate of ♂ acuminately trigonal in outline, subgenital plate of ♂ compressed, produced acuminate. Supra-anal plate of ♀ sublinguiform, dorsal pair of ovipositor valves incurving at apices, ventral pair with distal section short, distinctly cut off from the more proximal portion by a transverse lamellation. Caudal femora with a strongly marked medio-dorsal lamellation at the genicular extremity, this in profile with its apex slightly acute, medio-dorsal carina with spaced oblique spiniform tubercles, the same, but less strongly developed and more numerous, on the dorso-external, dorso-internal, ventro-external and the ventral carinae, paginal pattern somewhat irregular with a series of longitudinally disposed median tubercles, genicular lobes rounded, non-spiniform; caudal tibiae with spines of internal margin very much larger and longer than those of the external margin except for the distal group of three, apical spine present on both margins.

Xomacris nuptialis (Gerstaeker) (Plate I, figs. 2-5.)

1889. *Procolpia nuptialis* Gerstaecker, Mittheil. Ver. Neu-Vorpomm. und Rügen, Greifswald, xx, p. 7. [♂, ♀; Olivença, Ega and Fonteboa, Amazonas [, Brazil].]

The original material, now before me, consisted of one male each from Olivença and Fonteboa, and a single female from Ega. The Olivença male is in perfect condition, except for the tip of the right antenna, is well spread and here selected as the lectotype.

I have also before me two females of *nuptialis* from the upper Amazon, one from Teffé, Amazonas, Brazil, taken October, 1924, by H. Bassler, and the property of the American Museum of Natural History, and the other from the Napo River, Loreto, Peru, taken July, 1920, by H. S. Parish, belonging to the Academy. Both of these specimens fully agree with the allotypic female from Ega except as here noted.

The measurements of the five specimens now before me are as follows:

	Length of body	Length of antenna	Length of fastigium cephalad of margin of eyes	Length of pronotum	Length of tegmen	Length of caudal femur
♂, Fonteboa, Amazonas, Brazil, *paratype*	24.8	15.4	1.30	6.8	26.0	13.8
♂, Olivença, Amazonas, Brazil, *type*	25.0	17.2	1.30	6.8	27.3	14.9
♀, Ega, Amazonas, Brazil, *allotype*	39.0	17.2	1.63	10.7	38.5	19.8
♀, Teffé, Amazonas, Brazil	38.0	17.5	1.63	10.9	35.0	19.5
♀, Napo River, Loreto, Peru	39.5	16.6	1.79	10.9	37.0	19.5

As is generally the case with Gerstaecker's descriptions his presentation of the coloration of this species is quite good and in fair detail. However, a few further notes, drawn from his material and the few additional specimens here reported, may be of service to students. In the male the contrast in coloration between the pea-green anal field and the adjacent post-ulnar area of the discoidal field of the tegmina, and the mummy brown of the marginal and remainder of the discoidal fields of the same, is sharp and decided, and is equally marked in both of the males now before me. In the female, however, we find some variation in the tegminal coloration. Gerstaecker describes this in the female as " parte externa fusco-alboque picta," and this condition, as shown in the accompanying photograph of the allotypic female, is also found in the Napo River female, although in the latter the mummy brown semi-circular areas are larger and more extensive longitudinally. In the female from Teffé, which as a whole is somewhat paler in tone than the other two females, these darker areas are broken up into merely clouds, not sharply defined as in the others, and the marginal field is not as solidly dark as in the latter, but has two poorly defined darker areas separated by a somewhat paler one, as well as a similar pale patch proximad in the same field. Also it should be noted that the wing disk of the two males is slightly different in coloration, in the type the orange becomes more yellowish proximad (nearer primuline yellow of Ridgway), while in the paratypic male the disk is virtually primuline yellow, paling slightly proximad. Both specimens have been spread for many years, so if fading has

been a factor it should have influenced both specimens. In the female allotype the solidly colored wing disk is rich cadmium orange.

Cyrtacanthacridinae

PRORACRIS Uvarov

1889. *Prorachthes* Gerstaecker. Mittheil. Naturw. Ver. Neu-Vorpomm. und Rügen, Greifswald, xx, p. 38. [Not *Prorachthes* Loew, Berlin. Entom. Zeit., 12, p. 381 (1868).]

1898. *Prorachtes* Giglio-Tos, Bollett. Mus. Zool. Anat. Comp. Torino, xiii, no. 311; p. 44. [Emendation.]

1940. *Proracris* Uvarov, Ann. and Mag. Nat. Hist. (11) vi, p. 117. [To replace *Prorachthes* Gerstaecker, not of Loew.]

Genotype (by monotypy).—*P. insignis* (Gerstaecker).

While Kirby apparently had seen no material of this genus, he placed it[11] in the immediate neighborhood of Walker's genus *Legua,* an action which can be fully endorsed with Gerstaecker's type material of his *Prorachtes* and both sexes of *Legua* before me. In recent papers, Costa Lima[12] and Liebermann[13] have intimated that the present genus has some affinity with *Episcopotettix* Rehn, and that the two might not be separable, perhaps following a suggestion made by Hebard in 1924.[14] With the type material of the genotypic species of each before me it is fully evident that there is no relationship, and that *Proracris* (i.e. *Prorachthes* Gerstaecker) and *Legua* on one hand, and *Episcopotettix* on the other, represent different tribes.[15]

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[11] Syn. Catal. Orth., iii, p. 408 (1910).

[12] Rev. Brasil. Biol., 2 (1), pp. 60-61 (1942).

[13] Rev. Brasil. Biol., 7 (3), p. 393 (1947).

[14] Trans. Amer. Entom. Soc., l, p. 114.

[15] Bruner in 1908 (Biol. Centr.-Amer., Orth., ii, p. 251) incorrectly regarded *Legua* and Gerstaecker's genus as inseparable. While he had before him material of *Legua,* he was unacquainted with the Amazonian *Prorachthes* of Gerstaecker. Hebard (vide supra), while never having seen the latter, strongly disagreed with Bruner, and regarded the two as distinct genera. The latter author also pointed out the erroneous statement of various authors that *Proracris* (= *Prorachthes*) and also *Legua* have the mesosternal lobes attingent, as in certain other groups. The errors made by Hebard in his discussion were in bringing *Episcopotettix* into the matter, and in suggesting possible relationship of *Proracris* to the "Copiocerae," from which both genera here considered are abundantly distinct.

The genera *Proracris* (*Prorachthes* Gerstaecker) and *Legua,* agree in many respects, having the same general type of acutely produced head, with the antennae inserted near the rostral apex and widely removed from the eyes, in the dorsum of the rostration caudad to the eyes having a fine median sulcation, in the generally similar construction of the frontal costa, and of the clypeus and the labrum, as well as the pronounced cephalic acute production of the galeae,[16] in the basically similar type of prosternal development, of pronotal form, of alar type and venation, of limb structure and of disparity of length of caudal tibial spines (those of the internal margin being longer in both) with an external apical one, in the compressed and medio-longitudinally sulcate supra-anal plate in the female, and in the ovipositor jaws being of the usual recurved acridoid type. The male sex of *Proracris* is as yet undescribed.

The differences between the two genera are clearly evident (in the female sex), these being chiefly the more slender and less fusiform general structure of *Proracris,* which also has its cephalic rostration more produced,[17] this cephalad of the eyes being approximately equal to twice the length of the head caudad of the eyes, instead of but slightly more than the latter dimension as in *Legua;* in the lateral margins of the cephalic rostration converging cephalad much more gradually to the antennal insertion than in *Legua;* in the eyes being smaller, less evident and more ovate in basal outline than in *Legua;* the tegminal apices are more acuminate and more narrowly rounded than in *Legua;* the prosternal tubercle of *Proracris* is more elongate and less transverse cordiform than it is in *Legua;* the mesosternal lobes are subcontiguous at the middle of their length, instead of well separated throughout as in *Legua;* the interspace between the metasternal lobes is distinctly longitudinal, instead of trigonal as in *Legua;* while the subgenital plate of the female of *Proracris* has acute lateral lobations

[16] These suggest the type of development of the mouth-parts which was recently discussed by the author in a study of Australian members of the tribe Psednurini of the Pyrgomorphinae. (See Rehn, Grasshoppers and Locusts (Acridoidea) of Australia, II, pp. 222-223 (1953).) The term "galeoid" was there proposed for such specializations, and their probable correlation with habits suggested.

[17] There is some superficial resemblance in the rostration of *Proracris* to that of the Indo-Malayan genus *Carsula,* which, however, is in no way closely related to *Proracris.* Brunner in 1893 (Ann. Civ. Stor. Nat. Genova, XXXIII, p. 137) erroneously assumed this genus and *Carsula* were members of the same group. With both before me I can say that is incorrect.

of the distal margin deeply cut off from the median obtuse-angulate section of the same, instead of the whole margin being acute angulate with no well-marked lateral lobations as in *Legua*.

The genera *Proracris* and *Legua* have no other near relatives in the New World, and appear to constitute a distinct tribe, for which the name Leguini [18] may be used. Possessing external apical spines on their caudal tibiae, they also have the internal spines of the same parts much larger than the external ones, distinctive types of rostral, facial, antennal and pronotal developments, as well as tegmina with generalized venation. Both genera have Brunner's organ present. Until we know the male of *Proracris* it will not be possible to make further comments on the type of male external (or internal) genitalia of these genera. In *Legua,* however, the male has an acuminate supra-anal plate, which is narrowly sulcate medio-longitudinally, simple cerci and the subgenital plate is compressed and produced, and most remarkably upcurved distad in a subfalcate fashion, the narrow dorsal surface of its production being bisulcate.

Proracris insignis (Gerstaecker) (Plate II, figs. 9 and 10.)

1889. *Prorachthes insignis* Gerstaecker, Mittheil. Naturw. Ver. Neu-Vorpomm. und Rügen, Greifswald, xx, p. 40. [♀ ; Olivença (Amazonas) [, Brazil] and Jurimaguas [= Yurimaguas], Peru.]

The original material of this species consists of two females, one from each of the original localities. While the specimen from Yurimaguas has one antenna damaged, it is as a whole in somewhat better shape than the Olivença individual, and is here selected as the single type (or lectotype), and several figures of it are here presented.

Gerstaecker's original description, the comments made above under the genus, and the accompanying figures fully present the features of the genus and species, and a redescription is unnecessary.

The type (lectotype) and paratype have the following measurements (in millimeters) :

[18] This is a modification of Willemse's suggested "Section Legua" of 1928 (Zoolog. Mededeelingen, xi, p. 5).

	Length of body	Length of antenna	Length of rostrum cephalad of eyes	Length of pronotum	Length of tegmen	Length of caudal femur
♀, Yurimaguas, Peru, *type*	83.5	24.7	11.5	9.1	41.0	27.2
♀, Olivença, Amazonas, Brazil, *paratype*	86.5	26.7	10.9	9.2	40.5	26.2

Inasmuch as there has been much misunderstanding and some discussion in the last few decades regarding *Legua* Walker and *Episcopotettix* Rehn, involving as they do a number of assumptions regarding Gerstaecker's *Prorachthes,* I am presenting illustrations of both of the former genera, and here append some critical comments which should clear up some of the uncertainty which has existed regarding these genera.

LEGUA Walker

1870. *Legua* Walker, Catal. Derm. Salt. Brit. Mus., III, p. 502.

Genotype (by monotypy).—*Legua crenulata* (Stoll).

Two points in Walker's original description are misleading, the first being that the antennae are described as setaceous, whereas they are faintly ensiform, or at least somewhat flattened, near their bases; the other that the prosternal process is said to be obtusely bidentate, when as figured by Willemse [19] for Stoll's type, it is a transverse structure, divided medio-longitudinally by a deep impression into two rounded lobes, the whole broadening caudad, and with its caudal outline, as seen from the venter, obtusely emarginate. The genotypic species is the only one known.

Legua crenulata (Stoll) (Plate III, figs. 12-14.)

1813. [*Gryllus* (*Locusta*)] *crenulatus* Stoll, Afbeeldingen Beschr. Zabel-en Trek-Springhanen, etc., p. 14, pl. VIb, fig. 18, and register p. 12. [♀ [not ♂ [20]]; "Africa."]

As has been pointed out by Bruner [21] the original locality was erroneous, and authors following Stoll probably merely copied it from him. Walker specifically gives "Africa" as the habitat of the specimen examined by him, and which served him as the basis

[19] Zoolog. Medeleelingen, XI, pl. 1, fig. 6 (1928).

[20] See Willemse, Zoolog. Medeleelingen, XI, p. 3 (1928).

[21] Biol. Centr.-Amer., Orth., II, p. 252 (1908).

for the genus *Legua*. This, however, originally came from the Children collection, and may have had the same history as the type. Willemse [22] has given a redescription and a photographic figure of Stoll's type, as well as a drawing of its distinctive prosternal process, to which reference is made above. Unfortunately Stoll's specimen now lacks the caudal tibiae.

To my mind, however, Willemse made a serious mistake in referring *Legua* to the subfamily Pyrgomorphinae, with which I feel certain it has no real relationship. The fastigium in *Legua* is not divided vertically, as is the case with pyrgomorphids, and a superficial examination could have confused the shallow median surface sulcation of the fastigium and the sulcation of the dorsal section of the frontal costa, with the vertically divided fastigium of a typical pyrgomorphid.

Material of this species before me in the Academy series bears the following data:

Canal Zone, Panama: Barro Colorado Island; VII, 1930; (J. Zetek); 1♂: VII, 10, 1933; (T. H. Johnson); 1♀.

Costa Rica: San Carlos,[23] 200 meters elevation; 1♀. Castilla Farm, lower Rio Reventazón; VII, 29, 1936; (C. W. Dodge); 1♂. El Hogar;[24] VI, 1906; (M. A. Carriker, Jr.); 1♂, 1♀.

It is evident from the known localities that *Legua crenulata* is an inhabitant of lowland rain-forest country, although not necessarily occurring in the forest itself. The San Carlos female is probably that on which Bruner based his San Carlos record in the "Biologia," [25] as it came to the Academy from Bruner via the Hebard Collection. The other published records known to me are of its capture at Port Limón, Costa Rica,[26] and "Panama" and Porto Bello, Panama.[27] It apparently is not a common species, as while the author spent portions of two different seasons in field work in Costa Rican rain-forest country, and much of this not many miles from El Hogar, he was never fortunate enough to take the genus.

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[22] Zoolog. Medeleelingen, xi, pp. 3-5, pl. II, fig. 7 (1928).

[23] On the Rio San Carlos, in the Llanos de San Carlos, San Juan drainage.

[24] A banana plantation three miles from Guácimo, on the "Linea Vieja" from La Junta to Guápiles.

[25] Orth., ii, p. 252 (1908).

[26] Bruner, Biol. Centr.-Amer., Orth., ii, p. 252 (1908).

[27] Hebard, Trans. Amer. Entom. Soc., l, pp. 114-115 (1924).

EPISCOPOTETTIX Rehn

1903. *Episcopotettix* Rehn, Trans. Amer. Entom. Soc., XXIX, p. 13.
1942. *Rehnacridium* Costa Lima, Rev. Brasil. Biol., 2 (1), p. 63, text-figs. 3-5.

Genotype (by monotypy).—*E. sulcirostris* Rehn.

The synonymy of *Rehnacridium* has been suggested by Liebermann,[28] and with the figures given by Costa Lima, the type of *Episcopotettix sulcirostris* and females later referred by me to the latter genus,[29] before me, I find his suggestion warranted. I believe, however, that Costa Lima's species *incognitum,* based on a unique female, is distinct specifically from *sulcirostris,* which was based on a unique male, as his species appears to differ in a number of respects from the two females which I previously reported as of *E. sulcirostris,* from Goyaz, Brazil. The emphasis of the rostral sulcation in the male type of *sulcirostris* may be due to its having been liquid preserved in years past, and afterwards mounted and dried, a process which often emphasizes depressions and exaggerates elevations by buckling the chitin.

As to the relationship of *Episcopotettix* it will be necessary for more critical work to be done with certain other Neotropical generic entities, and a more careful evaluation of certain characters than has been done in the past, before a warranted conclusion can be reached. It is possible that too much emphasis has been placed in the past on certain structural features which are clearly reflections of modes of life, such as expansion of the lateral margins of the caudal tibiae, and probably the position of spine groups on the same, while on the other hand it would appear that not enough value had been given at generic levels to basic ovipositor structure in the females, which is, of course, a reflection of a method of oviposition. Certain of the supposed basic assemblages of Neotropical Cyrtacanthacridinae have clearly been dumping places for quite diverse types, and others have been separated on very inconsequential grounds. The weighing of what may be purely parallelisms in lines of diverse origin, and the construction of a clearer phylogenetic arrangement, must await more comprehensive work,

[28] Rev. Brasil. Biol., 7 (3), pp. 392-393 (1947).

[29] Proc. Acad. Nat. Sci. Phila., 1920, p. 249 (1920).

and on the basis of a broad representation of the many genera involved. Brunner's organ is present in *Episcopotettix*.

Episcopotettix sulcirostris Rehn (Plate I, figs. 6-8.)

1903. *Episcopotettix sulcirostris* Rehn, Trans. Amer. Entom. Soc., XXIX, p. 13. [♂ ; "Forest of San Juan, Mexico" (clearly erroneous).]

The accompanying illustration of the previously unfigured type may prove helpful to other students. One of the females from Goyaz, Brazil, previously reported,[30] is also figured to help clarify the query made above, under the generic discussion, as to whether Costa Lima's *incognitum*,[31] from the State of Rio de Janeiro, Brazil, may not prove distinct from *sulcirostris*. The measurements of the two Goyaz females have already been given,[32] and when these measurements and the present illustrations are compared with those given by Costa Lima, it would seem that his species is a distinct entity.

The correctness of the original locality was queried by me in years past,[33] and there can be little doubt but that it is erroneous. It was placed on the specimen many years ago, long before my active association with entomological work, and probably was an erroneous transcription, or several lots of wet material were inadvertently confused. The Goyaz record and probably Liebermann's Misiones, Argentina, report [34] may well outline the distributional area of the species. It is possible that Costa Lima's *incognitum* replaces it in the quite different, more coastal territory.

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[30] Rehn, Proc. Acad. Nat. Sci. Phila., 1920, p. 250 (1920).

[31] *Rehnacridium incognitum* Costa Lima, Rev. Brasil. Biol., 2 (1), p. 64, figs. 3, 4 and 5. [♀ ; Pinheiro, Rio de Janeiro, Brazil.]

[32] Proc. Acad. Nat. Sci. Phila., 1920, p. 251 (1920).

[33] Proc. Acad. Nat. Sci. Phila., 1920, p. 249, footnote 29 (1920).

[34] Rev. Brasil. Biol., 7 (3), p. 393 (1947).

Explanation of Plates

Plate I

Fig. 1.—*Prorhachis granulosa* Scudder. ♂ Yurimaguas, Peru. Dorsal view. (Eight-ninths of natural size.)

Fig. 2.—*Xomacris nuptialis* (Gerstaecker). ♂ (*type*). Olivença, Amazonas, Brazil. Dorsal view. (Slightly less than natural size.)

Fig. 3.—*Xomacris nuptialis* (Gerstaecker). ♂ (*type*). Olivença, Amazonas, Brazil. Lateral view. (Slightly less than natural size.)

Fig. 4.—*Xomacris nuptialis* (Gerstaecker). ♀ (*allotype*). Ega, Amazonas, Brazil. Dorsal view. (Seven-eighths of natural size.)

Fig. 5.—*Xomacris nuptialis* (Gerstaecker). ♀ (*allotype*). Ega, Amazonas, Brazil. Lateral view. (Seven-eighths of natural size.)

Fig. 6.—*Episcopotettix sulcirostris* Rehn. ♂ (*type*). "Forest of San Juan, Mexico." Dorsal view. (Ten-elevenths of natural size.)

Fig. 7.—*Episcopotettix sulcirostris* Rehn. ♀. Goyaz, Brazil. Lateral view. (Ten-elevenths of natural size.)

Fig. 8.—*Episcopotettix sulcirostris* Rehn. ♀. Goyaz, Brazil. Dorsal view. (Ten-elevenths of natural size.)

Plate II

Fig. 9.—*Proracris insignis* (Gerstaecker). ♀ (*type*). Yurimaguas, Peru. Dorsal view. (Slightly less than natural size.)

Fig. 10.—*Proracris insignis* (Gerstaecker). ♀ (*type*). Yurimaguas, Peru. Lateral view. (Slightly less than natural size.)

Fig. 11.—*Prorhachis granulosa* Scudder. ♀ (*type* of *Procolpia* (*Prorhachis*) *gonagra* Gerstaecker). Fonteboa, Amazonas, Brazil. (Approximately nine-tenths of natural size.)

Plate III

Fig. 12.—*Legua crenulata* (Stoll). ♂. Barro Colorado Island, Canal Zone, Panama. Dorsal view. (Slightly less than natural size.)

Fig. 13.—*Legua crenulata* (Stoll). ♀. El Hogar, Costa Rica. Dorsal view. (Approximately nine-tenths of natural size.)

Fig. 14.—*Legua crenulata* (Stoll). ♀. El Hogar, Costa Rica. Lateral view. (Approximately nine-tenths of natural size.)

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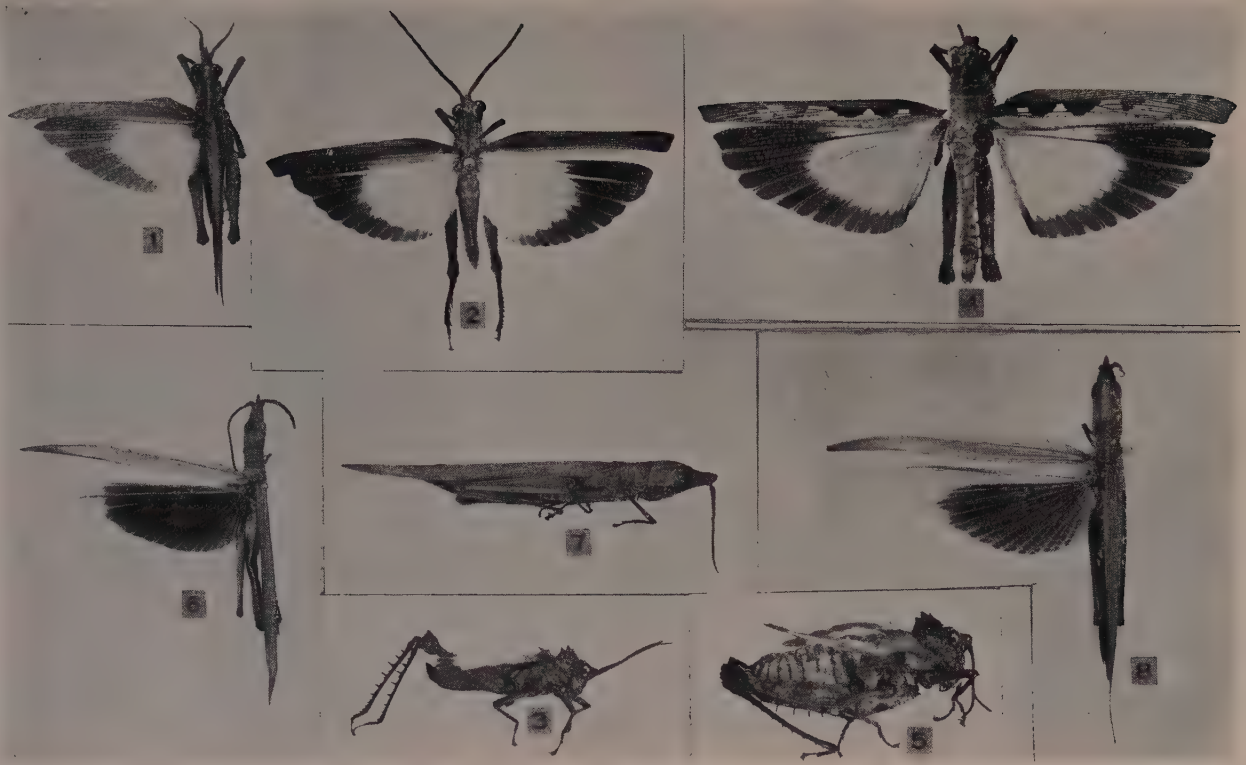
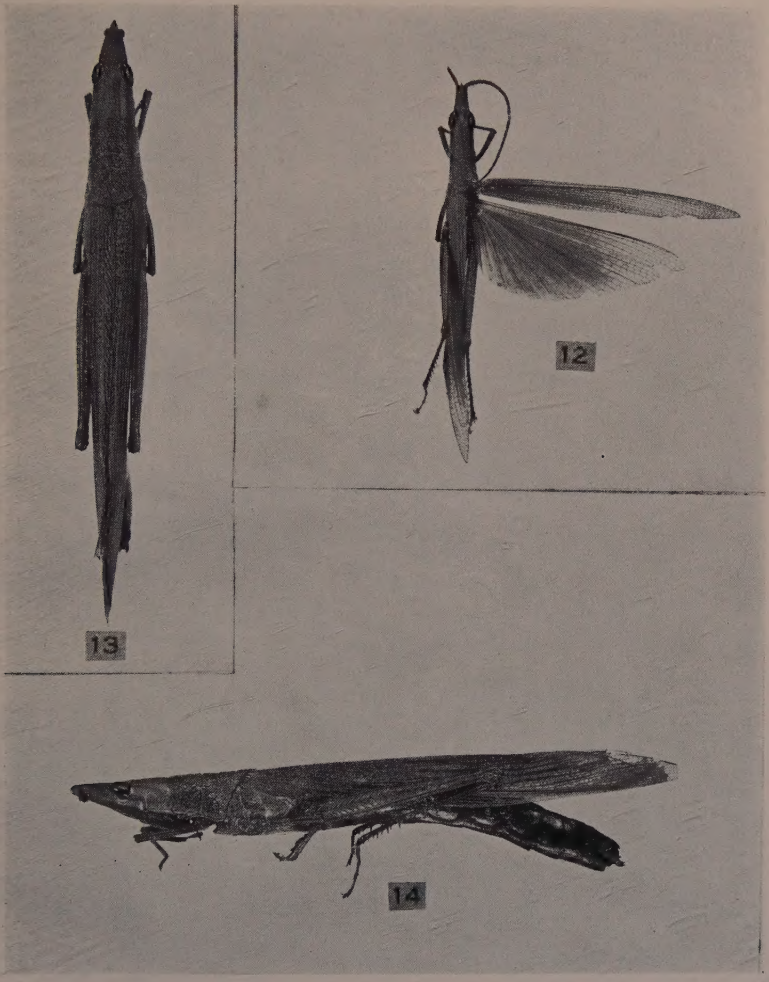


REHN—GERSTAECKER TYPES, II

REHN—GERSTAECKER TYPES, II



REHN—GERSTAECKER TYPES, II